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Epitome

(57) [Abstract]

[Technical problem] There are not yellow-izing of the lens under the effect of an ultraviolet ray absorbent, change of a refractive index, etc., and the plastic lens with which the mechanical strength of a lens does not fall further is offered.

[Means for Solution] It is characterized by forming the plastic lens of this invention using the constituent for plastic lenses containing the resin ingredient which mainly contains a urethane resin ingredient, and the ultraviolet ray absorbent whose absorption maximum wavelength in a chloroform solution is less than 345nm. As for the addition of said ultraviolet ray absorbent, it is desirable that it is 0.02 - 2.0wt% to resin ingredient 100wt%.

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CLAIMS

[Claim(s)]

[Claim 1] The plastic lens characterized by being formed using the constituent for plastic lenses containing the resin ingredient which mainly contains a urethane resin ingredient, and the ultraviolet ray absorbent whose absorption maximum wavelength in a chloroform solution is less than 345nm.

[Claim 2] The plastic lens according to claim 1 whose addition of said ultraviolet ray absorbent to said resin ingredient 100wt% is 0.02 - 2.0wt%.

[Claim 3] Said ultraviolet ray absorbent is a plastic lens according to claim 1 or 2 which is at least one sort chosen from the group which consists of 2-(5-methyl-2-hydroxyphenyl) benzotriazol, 2-(5-t-butyl-2-hydroxyphenyl) benzotriazol, and 2-(5-t-octyl-2-hydroxyphenyl) benzotriazol.

[Claim 4] Said resin ingredient is a plastic lens according to claim 1 to 3 which is a thing containing a sulfhydryl group content compound.

[Claim 5] Said constituent for plastic lenses is 0.01-10 ppm about a bluing agent. Plastic lens according to claim 1 to 4 to contain.

[Claim 6] The plastic lens according to claim 1 to 5 whose spectral transmittance of 400nm in 2mm thickness is 10% or less.

[Claim 7] The plastic lens according to claim 1 to 6 whenever [in 2mm thickness / yellow /

whose] (YI value) is 1.5 or less.

[Claim 8] Said plastic lens is a plastic lens according to claim 1 to 7 which is a lens for glasses.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] This invention relates to a plastic lens, especially the plastic lens which consists of urethane resin which has ultraviolet absorption ability.

[0002]

[Description of the Prior Art] a plastic lens is lightweight compared with a glass lens, cannot break easily, and can be dyed, and precision shaping is easy for it — etc. — it is spreading through optical lens products, such as a spectacle lens, a camera lens, a Fresnel lens, a lenticular lens, and prism, quickly from a point in recent years. Especially, optical strain of urethane resin are small, and since it is excellent in transparency or shock resistance, its safety is high, and it has been used as a lens for glasses etc.

[0003] Furthermore, ultraviolet absorption ability is given to such a plastic lens, and what protects an eye etc. from the failure by ultraviolet rays is proposed. However, in order to give ultraviolet absorption ability, what has ultraviolet absorption ability was used for the resin ingredient for lenses itself, and coating the front face of a plastic lens with an ultraviolet absorption layer was performed.

[0004] However, by these approaches, there was a problem of the mechanical strength of a lens falling by the complementary color agent added in order for a lens to yellow-ize, or for a refractive index to change and to adjust this yellow-ization by the color (yellow) of the resin ingredient for lenses, or the ultraviolet ray absorbent itself.

[0005]

[Problem(s) to be Solved by the Invention] The purpose of this invention is to offer the plastic lens which does not have yellow-izing of the lens under the effect of an ultraviolet ray absorbent, change of a refractive index, etc., and does not have the fall of the mechanical strength of a lens further.

[0006]

[Means for Solving the Problem] Such a purpose is attained by this invention of following the (1) - (8).

[0007] (1) The plastic lens characterized by being formed using the constituent for plastic lenses containing the resin ingredient which mainly contains a urethane resin ingredient, and the ultraviolet ray absorbent whose absorption maximum wavelength in a chloroform solution is less than 345nm.

[0008] (2) A plastic lens given in the above (1) whose addition of said ultraviolet ray absorbent to said resin ingredient 100wt% is 0.02 - 2.0wt%.

[0009] (3) Said ultraviolet ray absorbent is a plastic lens the above (1) which is at least one sort

chosen from the group which consists of 2-(5-methyl-2-hydroxyphenyl) benzotriazol, 2-(5-*t*-butyl-2-hydroxyphenyl) benzotriazol, and 2-(5-*t*-octyl-2-hydroxyphenyl) benzotriazol, or given in (2).

[0010] (4) Said resin ingredient is a plastic lens the above (1) which is a thing containing a sulfhydryl group content compound thru/or given in either of (3).

[0011] (5) Said constituent for plastic lenses is 0.01–10 ppm about a bluing agent. Plastic lens the above (1) to contain thru/or given in either of (4).

[0012] (6) The above (1) whose spectral transmittance of 400nm in 2mm thickness is 10% or less thru/or a plastic lens given in either of (5).

[0013] (7) The above (1) whenever [in 2mm thickness / yellow / whose] (YI value) is 1.5 or less thru/or a plastic lens given in either of (6).

[0014] (8) Said plastic lens is a plastic lens the above (1) which is a lens for glasses thru/or given in either of (7).

[0015]

[Embodiment of the Invention] Hereafter, the plastic lens of this invention is explained to a detail.

[0016] The plastic lens of this invention is characterized by being formed using the constituent for plastic lenses containing the resin ingredient which mainly contains a urethane resin ingredient, and the ultraviolet ray absorbent whose absorption maximum wavelength in a chloroform solution is less than 345nm. Thereby, yellow-ization of the lens by the ultraviolet ray absorbent itself can be controlled, giving ultraviolet absorption ability to a plastic lens.

[0017] Moreover, the plastic lens which consists of urethane resin has the transparency required of a lens product, shock resistance, thermal resistance, and good chemical resistance in especially the application as an optical lens, and the plastic lens of a high refractive index excellent in surface hardness and a mechanical strength can be formed.

[0018] The resin ingredient of this invention has a desirable thing containing the compound which has an isocyanate radical, and a sulfhydryl group content compound. Thereby, the refractive index of a plastic lens can be raised.

[0019] as a sulfhydryl group content compound, especially if compatibility with other resin ingredients and the constituent for plastic lenses is good, it will not be limited, for example, aliphatic series thiol compounds, alicycle group thiol compounds, aromatic series thiol compounds, heterocycle content thiol compounds, etc. are mentioned, and independent in these -- or you may use it, combining two or more.

[0020] It is desirable that it is at least one sort chosen from the group which consists of 2-(5-methyl-2-hydroxyphenyl) benzotriazol, 2-(5-*t*-butyl-2-hydroxyphenyl) benzotriazol, and 2-(5-*t*-octyl-2-hydroxyphenyl) benzotriazol as an ultraviolet ray absorbent used in this invention.

[0021] Especially each of these compounds have very good compatibility with a urethane resin ingredient, at the time of a polymerization or use of a lens, an ultraviolet ray absorbent produces bleed out and there are no degradation and possibility of deteriorating of the engine performance. Furthermore, the effectiveness excellent in control of yellow-izing of a lens is demonstrated, giving the ultraviolet absorption ability of a plastic lens effectively.

[0022] In this invention, as for the addition of an ultraviolet ray absorbent, it is desirable that it is 0.02 – 2.0wt% to the resin ingredient 100 weight section, and it is still more desirable. [1.0 – 2.0wt% of] Sufficient ultraviolet absorption effectiveness is not acquired with the addition of an ultraviolet ray absorbent being less than [0.02wt%], but on the other hand, if 2.0wt% is exceeded, change of optical properties, such as yellow-izing of a lens and a refractive-index fall, will be produced, and there is a possibility that the mechanical strength of a lens may fall further.

[0023] In addition, about the addition sequence of an ultraviolet ray absorbent, and especially the combination approach, it may not be limited, but you may add in one phase of the polymerization processes of a urethane resin ingredient, or may add after a polymerization.

[0024] It is desirable to add a bluing agent as a complementary color agent to the constituent for plastic lenses furthermore. Thereby, few yellow tastes of a lens based on a resin ingredient or the ultraviolet ray absorbent itself are also cancelable, for example.

[0025] As an addition of a bluing agent, 0.01–10 ppm is desirable, and 0.1–1 ppm is more desirable. When many [if there are too few additions, the dissolution of the yellow taste may not be enough, and / too], there is a possibility that absorption of a bluing agent may become strong too much, and the permeability of a lens may worsen.

[0026] As a bluing agent, especially if application into resin ingredients, such as urethane resin, is possible, it will not be limited, for example, an anthraquinone system compound, a phthalocyanine system compound, a monoazo compound, a diazo compound, a triaryl methane system compound, etc. are mentioned.

[0027] It can fabricate in a predetermined configuration by the general shaping approaches, such as a cast polymerization, injection molding, and extrusion molding, using the above constituents for plastic lenses, and the plastic lens of this invention can be manufactured.

[0028] 10% or less has the desirable spectral transmittance of 400nm in 2mm thickness, and 5% or less of the plastic lens of this invention is still more desirable. Thereby, UV-A and UV-B harmful to a body tissue also in ultraviolet rays can be absorbed effectively, and it can consider as the plastic lens excellent in safety.

[0029] Moreover, as for the plastic lens of this invention, it is desirable that whenever [in 2mm thickness / yellow] (YI value) is 1.5 or less. When whenever [yellow] (YI value) exceeds 1.5, a lens may wear the yellow taste.

[0030] As for such a plastic lens, it is desirable that it is an optical lens, and as an optical lens, although lens for glasses, contact lens, Fresnel lens, rod-lens, lenticular lens, and ftheta lens etc. is mentioned, for example, especially the lens for glasses is desirable.

[0031] As mentioned above, although the plastic lens of this invention was explained, this invention may be the plastic lens which is not limited to these, added various kinds of additives, such as an antioxidant besides an ultraviolet ray absorbent, a pigment, a sedimentation inhibitor, a defoaming agent, an antistatic agent, and an antifogger, at the constituent for plastics if needed, for example, was manufactured.

[0032] Moreover, the plastic lens of this invention may perform chemical preparation, such as acid resisting, wear-resistant improvement, chemical-resistant improvement, surface polish, antistatic treatment, and rebound ace court processing, or physical processing according to an application etc.

[0033]

[Example] Next, the concrete example of this invention is explained.

[0034] 1. Production of Plastic Lens (Example 1)

[0035] The plastic lens made of urethane resin without whenever [of 2mm thickness] was produced from the constituent for plastic lenses containing the following resin ingredient, an ultraviolet ray absorbent, and an additive (complementary color agent).

[0036]

<Resin ingredient> m-xylylene diisocyanate : 43.5wt% pentaerythritol tetrakis (3-mercaptopropionate)

:56.5wt% [0037]

<Ultraviolet ray absorbent> ultraviolet ray absorbent : 2.0wt%-(5-methyl-2-hydroxyphenyl) benzotriazol (lambdamax:340nm)

[0038] <Additive> bluing agent: Mitsubishi Chemical, Inc. "Diaresin blue D" : 0.6 ppm [0039]

Djibouti rutin dichloride 0.02wt% was mixed with the above-mentioned resin ingredient 100wt% as a catalyst, and monomer mixed liquor was prepared.

[0040] Into this monomer mixed liquor, the above-mentioned ultraviolet ray absorbent and the bluing agent were added, and it mixed so that it might become homogeneity.

[0041] Subsequently, after deaerating this mixed solution, it poured into the mold, thermal polymerization was performed, and the mold goods of a lens were obtained. Each component and each presentation are shown in Table 1.

[0042]

[Table 1]

表 1

	プラスチックレンズ用組成物		
	樹脂材料 [wt%]	紫外線吸収剤	補色剤 [ppm]
		極大吸収波長 (nm) [wt%]	
実施例 1	m-キシリレンジイソシアネート : 43.5 ペンタエリスリ-トリメチス(3-メチルブトキシ)エーテル : 56.5	2-(5-メチル-2-ヒドロキシフェニル)ベンゾトリアゾール (340nm) : 2.0	0.6
実施例 2	m-キシリレンジイソシアネート : 51.5 4-メチルブトキシ-3,6-ジチオ-1,8-オクタジチオール : 48.5	2-(5-メチル-2-ヒドロキシフェニル)ベンゾトリアゾール (340nm) : 2.0	0.6
実施例 3	m-キシリレンジイソシアネート : 43.5 ペンタエリスリ-トリメチス(3-メチルブトキシ)エーテル : 56.5	2-(5-tert-オクチル-2-ヒドロキシフェニル)ベンゾトリアゾール (340nm) : 2.0	0.6
実施例 4	m-キシリレンジイソシアネート : 51.5 4-メチルブトキシ-3,6-ジチオ-1,8-オクタジチオール : 48.5	2-(5-tert-オクチル-2-ヒドロキシフェニル)ベンゾトリアゾール (340nm) : 2.0	0.6
実施例 5	m-キシリレンジイソシアネート : 43.5 ペンタエリスリ-トリメチス(3-メチルブトキシ)エーテル : 56.5	2-(5-tert-ブチル-2-ヒドロキシフェニル)ベンゾトリアゾール (340nm) : 1.0	0.6
比較例	ポリカーボネート樹脂粉末 : 100 (粘度平均分子量 23,700)	2-(2'-ヒドロキシ-5'-tert-オクチルフェニル)ベンゾトリアゾール (340nm) : 0.33	0.6

[0043] (Example 2) The plastic lens was produced like the example 1 except having changed the resin ingredient. Each component and each presentation are shown in Table 1.

[0044] (Example 3) The plastic lens was produced like the example 1 except having changed the ultraviolet ray absorbent. Each component and each presentation are shown in Table 1.

[0045] (Example 4) The plastic lens was produced like the example 3 except having changed the resin ingredient. Each component and each presentation are shown in Table 1.

[0046] (Example 5) The plastic lens was produced like the example 1 except having changed the ultraviolet ray absorbent and the addition.

[0047] (Example of a comparison) From the constituent for plastic lenses containing the following component, the plastic lens made of polycarbonate resin without whenever [of 2mm thickness] was produced.

[0048]

<Resin ingredient> polycarbonate resin powder: : 100wt% [0049]

<Ultraviolet ray absorbent> ultraviolet ray absorbent : 0.33wt% 2-(2'-hydroxy-5'-t-octyl phenyl) benzotriazol (lambda_{max}:340nm)

[0050] <additive> bluing agent: -- Mitsubishi Chemical, Inc. -- "Diaresin blue D":0.6ppm [0051]

The above-mentioned polycarbonate resin powder, the ultraviolet ray absorbent, and the bluing agent were mixed, and the mold goods of a lens were obtained with injection molding. Each component and each presentation are shown in Table 1.

[0052] 2. The following performance evaluation was performed about each plastic lens of the performance-evaluation above-mentioned examples 1-5 of a plastic lens, and the example of a comparison.

[0053] ** Whenever [yellow] (YI value)

JIS It measured based on K7200. The three-stage estimated the measured value as follows.

[0054]

YI value is 1.5 or less. ... [... x] OYI value is 1.5-2.0.. **YI value is 2.0 or more. [0055] ** The spectral transmittance in 400nm was measured using the ultraviolet absorption ability part optical altimeter U-3200 (Hitachi Make).

[0056] ** The refractive index of a 589.3nm D line was measured in 20 degrees C using the refractive-index Abbe refractometer.

[0057] Furthermore, the refractive index of the plastic lens which added the ultraviolet ray absorbent was compared with the refractive index of each plastic lens (whenever [2mm thickness] nothing lens) produced on the same conditions except not containing an ultraviolet

ray absorbent, what does not have change among both was made into O, and what changed was made into x.

[0058] ** the mechanical strength of the plastic lens produced in the mechanical-strength examples 1-5 and the example of a comparison and the mechanical strength of the plastic lens (whenever [2mm thickness] nothing lens) which consists only of examples 1-5 and a resin ingredient of each example of a comparison were measured, and the case where there was no difference in x and a mechanical strength about the case where a mechanical strength is small, compared with the plastic lens with which the plastic lens produced in examples 1-5 and the example of a comparison consists only of a resin ingredient was made into O.

[0059] In addition, the Charpy impact test (JIS K7111) performed the comparison of a mechanical strength. These results are shown in Table 2.

[0060]

[Table 2]

表 2

	黄色度 (YI)	分光透過率 400nm(%)	屈折率	屈折率 の変化	機械的強度 の変化
実施例1	○	5	1.592	○	○
実施例2	○	5	1.657	○	○
実施例3	○	5	1.592	○	○
実施例4	○	5	1.657	○	○
実施例5	○	5	1.592	○	○
比較例	○	80	1.585	○	×

[0061] The plastic lens of the above result to the examples 1-5 was what yellow-izing or the mechanical strength of a lens do not fall, but maintains a high refractive index further, demonstrating the outstanding ultraviolet absorption ability.

[0062] On the other hand, the plastic lens of the example of a comparison is inferior to ultraviolet absorption ability, and the mechanical strength of a lens fell with the ultraviolet ray absorbent further.

[0063]

[Effect of the Invention] As stated above, since it does not have yellow-ization of the lens by the ultraviolet ray absorbent and the plastic lens of this invention is maintaining the mechanical strength and the high refractive index further, demonstrating the outstanding ultraviolet absorption ability, it can be used for an application broad as a safe and highly precise lens for glasses.

[Translation done.]